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# Understanding Recent Eastern Horn of Africa Rainfall Variability and Change

**Brant Liebmann,[*] Martin P. Hoerling,[+] Chris Funk,[#] Ileana Bladé,[@] Randall M. Dole,[+] Dave Allured,[*] Xiaowei Quan,[*] Philip Pegion,[*] and Jon K. Eischeid[*]**

[*] *NOAA/Earth System Research Laboratory, and Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, Colorado*

[+] *NOAA/Earth System Research Laboratory, Physical Sciences Division, Boulder, Colorado*

[#] *U.S. Geological Survey, Earth Resources Observation and Science Center, Sioux Falls, South Dakota, and the Climate Hazards Group, University of California, Santa Barbara, Santa Barbara, California*

[@] *Departament d'Astronomia i Meteorologia, Facultat de Física, Universitat de Barcelona, and Institut Català de Ciències del Clima, IC3, Barcelona, Spain*

## Abstract

Observations and sea surface temperature (SST)-forced ECHAM5 simulations are examined to study the seasonal cycle of eastern Africa rainfall and its SST sensitivity during 1979–2012, focusing on interannual variability and trends. The eastern Horn is drier than the rest of equatorial Africa, with two distinct wet seasons, and whereas the October–December wet season has become wetter, the March–May season has become drier.

The climatological rainfall in simulations driven by observed SSTs captures this bimodal regime. The simulated trends also qualitatively reproduce the opposite-sign changes in the two rainy seasons, suggesting that SST forcing has played an important role in the observed changes. The consistency between the sign of 1979–2012 trends and interannual SST–precipitation correlations is exploited to identify the most likely locations of SST forcing of precipitation trends in the model, and conceivably also in nature. Results indicate that the observed March–May drying since 1979 is due to sensitivity to an increased zonal gradient in SST between Indonesia and the central Pacific. In contrast, the October–December precipitation increase is mostly due to western Indian Ocean warming.

The recent upward trend in the October–December wet season is rather weak, however, and its statistical significance is compromised by strong year-to-year fluctuations. October–December eastern Horn rain variability is strongly associated with El Niño–Southern Oscillation and Indian Ocean dipole phenomena on interannual scales, in both model and observations. The interannual October–December correlation between the ensemble-average and observed Horn rainfall 0.87. By comparison, interannual March–May Horn precipitation is only weakly constrained by SST anomalies.

Keywords: Africa, Climate variability, Interannual variability, Seasonal variability, Trends, Tropical variability

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*Corresponding author address:* Brant Liebmann, CIRES, University of Colorado, Campus Box 216, Boulder, CO 80309. E-mail: brant.liebmann@noaa.gov


Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718